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# Seasonal changes of the ambient noise recorded by the "13 BB star" array in northern Poland within the Trans European Suture Zone

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The variations in the azimuth of ambient noise sources, as well as the coherence of the average velocity of surface waves arrivals, were evaluated by applying beam forming and seismic interferometry techniques to the recordings carried out during 2014 at the "13 BB star" array composed of thirteen broadband seismic stations located in northern Poland within the Trans European Suture Zone.
The evaluation of the beam power for the whole array each five days for the horizontal and vertical components led to the estimation of the azimuth variation of noise sources during the entire 2014. Fifty days represent a reasonable period to observe seasonal variations of the azimuth in time. The analysis of the azimuths makes evident the strongest beam power associated to noise does not show a preferred direction. The azimuth is predominantly fluctuating between the North Sea and the Baltic Sea: nevertheless, secondary sources like the Atlantic Sea, the Mediterranean Sea and the Black Sea were also noticed. To put in evidence the seasonal variations, the amplitude associated to the principal source was evaluated for the three components. It shows high values in January, March, April, July, August and November, whereas it is low in the remaining months.
The analysis of the crosscorrelation between all the station pairs, obtained from the stacking of daily traces for January, April and September 2014 in the 0.1 1 Hz frequency band, allowed the estimation of precise values of velocities of surface waves. The best resolution to retrieve the surface waves is achieved in April, whereas in January and September several higher modes are still present in the traces. The fastest arrivals of surface waves are between ∼7 s at ∼20 km distance and ∼40 s at ∼120 km with an average velocity of ∼3 km/s. The second group of arrivals is located between ∼10 s at ∼20 km distance and ∼60 s at ∼120 km: accordingly, the average velocity is ∼2 km/s. The third group of arrivals, between ∼13 s at 20 km distance and ∼80 s at ∼120 km, has an average velocity of about 1.5 km/s. The slowest arrivals are noticeable between ∼20 s at ∼20 km distance and ∼120 s at ∼120 km, with an average velocity of ∼1 km/s.
To know roughly the distance of the main noise sources from the "13 BB star" array, the associated average velocities were calculated from the beam power for the three components. They ranged between 2 km/s at near distance, and 4 km/s at far distance. The strongest beam power comes from a specific direction shifting consistently with the seasonal changes of the azimuth: in addition, the velocity related to this maximum correlates with the distance of the dominant noise source.
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